22. Passed June 22, 1884; also plotted on the chart as Nos. 17 and 18 in the positions in which it was reported by two other vessels.

23. Iron can-buoy, run into by a British bark June 17, 1884, about twelve miles from the Flemish Cap, on the banks of Newfoundland.

24. Large iron buoy, passed June 22, 1884, 'sixteen miles south-west from Gay Head,' Martha's Vineyard.

25. Large iron conical-shaped buoy, passed June 24, 1884, forty miles west of Bishop, Scilly Isles, off the west coast of England.

26. Black barrel-buoy, passed June 29, 1884.

27. Large red iron buoy, floating upright, passed July 7, 1884, seven miles from Bishop Rock, Scilly Isles.

28. Very large red iron buoy, passed Aug. 4, 1884.

29. Large conical-shaped iron buoy, passed Aug. 1, 1884.

30. Large iron can-buoy, which from appearances had been floating a very long time; passed Aug. 4, 1884.

31. Second-class can-buoy, picked up on the banks of Newfoundland, August, 1884.

32. Second-class can-buoy, picked up about twenty-five miles from Cape Elizabeth, Me., in August, 1884.

It would almost seem as if the buoys shown on this chart had attempted a system of circle-sailing, and as if several of them had nearly gotten round to their moorings after having circumnavigated the North-Atlantic Ocean. How else shall we account for the position of those picked up off the Canaries, those sighted in the Sargasso Sea, those found off Turk's Island and the Bermudas? When some of these data were presented to the Philosophical society at Washington, and the matter was discussed by naval, coast-survey, and light house officers, the weight of the expressed opinion seemed to be in favor of this theory.

But the object of this paper is to call attention to the fact that the voyages of these buoys show the trend of surface or submarine currents, of which we as yet know little, either as to their direction, force, or times of flow. The current indications on this chart show the approximate sum of our present knowledge on the subject. It is evident that it would be greatly to our advantage to know more. *Science* said a short time ago that it was unfortunate that the gas-buoy (No. 6) was picked up. Would it not be in the interests of science, of commerce, and of navigation, if some such object as that buoy, drawing as much water, floating as lightly, showing as little surface to the wind, and offering as little resistance to colliding vessels, were allowed to float, and were carefully watched until it should have gone ashore? And why could not some slow-sailing vessel be detailed for such duty? At any rate, if such an object were set afloat and reported by every vessel which sighted it, its voyage might add much to what we know of the ocean-currents; and if such objects were set adrift simultaneously, from, say, Nantucket, Penzance, Teneriffe, the Cape de Verde and Turk's Island, or the Bermudas, we might learn much more on this interesting subject.

A. B. JOHNSON.

DRUMLINS.

THE arched hills of glacial drift that have been called drumlins by the Irish geologists are among the most peculiar results of the action of land ice-sheets. They are composed of closely-packed bowlder-clay, or till, distinctly unstratified, and containing well-scratched stones. They rest on a foundation of glaciated rock, and rise in a smoothly rounded mass from fifty to two or three hundred feet in height, reaching from a quarter of a mile to two miles in length. Their bases vary in form from a circle to a long, narrow oval; and, when elongated, their major axes are closely parallel to the direction of former local glacial motion. They are therefore easily distinguished in form and structure from the rolling hills of terminal moraines, and from the ridges and mounds of osar and kames. Although they form pronounced features in a landscape, their distribution is as yet

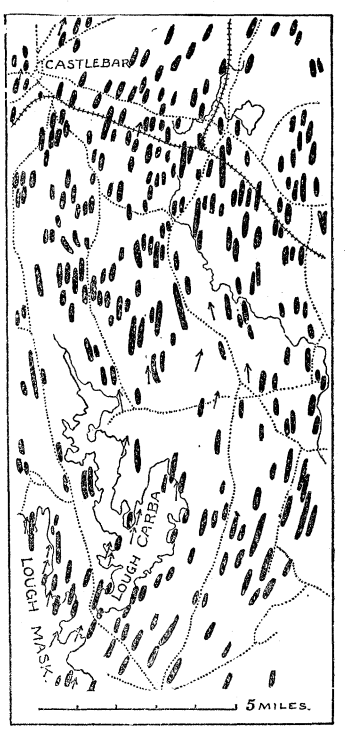

FIG. 1.

imperfectly understood. In continental Europe they have not attracted attention; but in Scotland and Ireland they are numerous and well known.

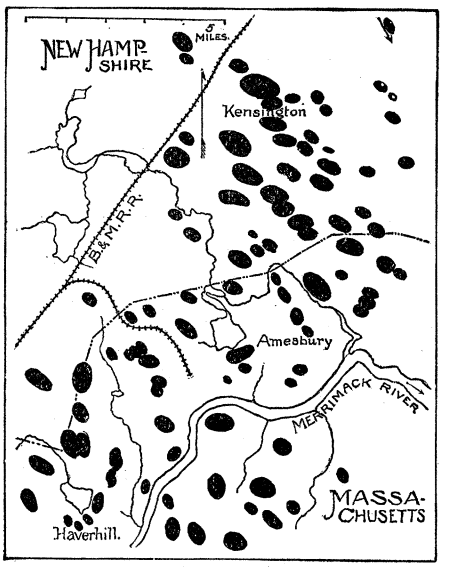

FIG. 2.

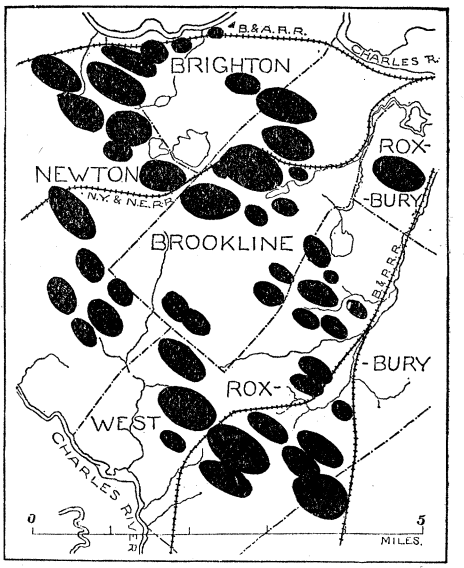

FIG. 3.

Fig. 1 shows a remarkable group of them in north-western Ireland, taken from a map prepared by Messrs. Kinahan and Close. In this country they have received careful study by Prof. C. H. Hitchcock and Mr. Warren Upham, of the New-Hampshire geological survey. Fig. 2 is copied from the south-eastern corner of their map; and fig. 4 presents a sketch of a few of these hills near the Merrimack, in the neighborhood of Amesbury, Mass. Around Boston they are again well developed, as illustrated in fig. 3, from a manuscript map by the author. Fig. 5 is a view of Corey's Hill, a few miles from the city, in the town of Brookline; and fig. 6 represents some of the harbor islands, nearly all of which are drumlins, more or less cut away by the waves. A great series of these drift-hills stretches through central Massachusetts into Connecticut, but its limits have never been studied. Two of them at Charlton, on the Boston and Albany railroad, are drawn in fig. 7.

FIG. 4.

FIG. 5.

Again in New-York, between Syracuse and Rochester, elongated drift-hills, that probably deserve the name of drumlins, may be seen in great numbers: here they have entire control of the topography, and

produce a most characteristic landscape. Fig. 8 gives the view south-east and south-west from one of the

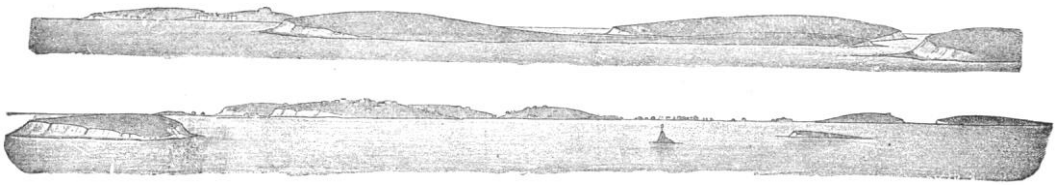

FIG. 6.

hills at the town of Clyde, on the New-York central railroad; and fig. 9 illustrates some of their common

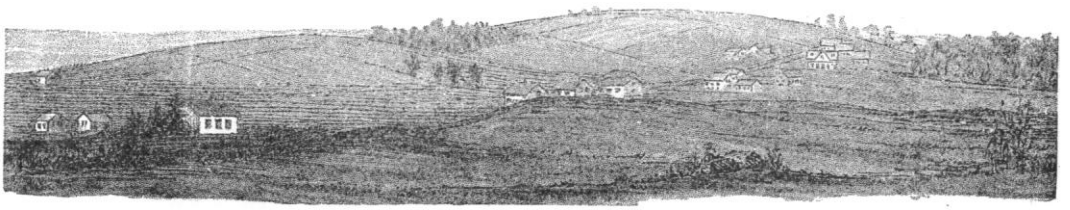

FIG. 7.

varieties of form. Farther west they are described only in Wisconsin, where they are sometimes circular

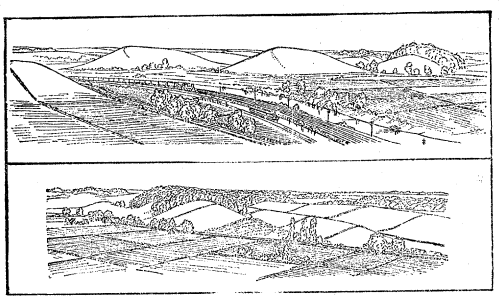

FIG. 8.

and symmetrical, as in fig. 10, from Professor Chamberlin's geological report.

As to origin, there is a general agreement now, among the observers who have studied them, that their present form is an immediate result of ice-action; but just how they were constructed is still an open question. The theory that seems most satisfactory is that which compares them to sand-banks in rivers, and

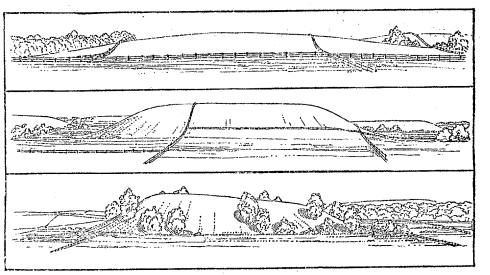

FIG. 9.

thus considers them the result of gradual local accumulation of drift beneath the old glacial sheet, where

FIG. 10.

From this brief survey, it may be seen that drumlins have both a wide and an irregular distribution, and, further, that much more observation and mapping are required before we shall acquire a satisfactory explanation of their seemingly accidental occurrence. more material was brought than could be carried away. The author will be pleased to learn of other localities for drumlins than those here mentioned.

W. M. DAVIS.

Cambridge, Mass.